

What is claimed is:

5 1. A formulation useful in retarding the growth of vegetation comprising an aqueous mixture containing a surfactant and glyphosate or a salt or ester thereof, the nature of said surfactant and the composition of said formulation being such that, upon application of the formulation to a plant, liquid crystals comprising said surfactant are formed on the foliage of the plant.

2. A formulation as set forth in claim 1 wherein the nature of said surfactant and the composition of said formulation are such that, upon application of the formulation to a plant, liquid crystals comprising said surfactant are formed in the foliage of said plant.

3. A formulation as set forth in claim 1 wherein the nature of said surfactant and the composition of said formulation are such that, upon application of the formulation to a plant, liquid crystals comprising said surfactant form transcuticular hydrophilic channels through the cuticle of said plant.

5 4. A formulation as set forth in claim 1 wherein the nature of said surfactant and the composition of said formulation are such that, upon application of the formulation to a plant, liquid crystals comprising said surfactant are formed on the foliage of said plant irrespective of the presence or absence of another surfactant.

5 5. A formulation as set forth in claim 4 wherein the nature of said surfactant and the composition of said formulation are such that, upon application of the formulation to a plant, liquid crystals comprising said surfactant are formed in the foliage of said plant irrespective of the presence or absence of another surfactant.

6. A formulation as set forth in claim 5 wherein an aqueous liquid may migrate within said liquid crystal in a hydrophilic region within which said hydrophilic moieties of said one stratum and said second stratum are disposed.

7. A formulation as set forth in claim 6 wherein cationic moieties of surfactant molecules of said one stratum are in contact with a hydrophobic surface on said foliage or within a cuticle of said plant.

8. A formulation as set forth in claim 6 wherein said hydrophilic region comprises a channel for penetration of glyphosate into cuticles of said plant.

9. A formulation as set forth in claim 7 wherein said hydrophilic region comprises a channel for uptake and translocation of glyphosate within said plant.

10. A formulation as set forth in claim 1 wherein said liquid crystals are lyotropic.

11. A formulation as set forth in claim 1 which is substantially devoid of liquid crystals comprising said surfactant but having a composition such that, upon application of the formulation to a plant, liquid crystals comprising said surfactant are formed in an aqueous layer on the surface of foliage of the plant.

12. A formulation as set forth in claim 1 wherein the weight ratio of glyphosate to said surfactant is not greater than about 10:1.

13. A formulation as set forth in claim 1 containing between about 500 and about 600 grams per liter glyphosate acid equivalent.

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14. A formulation as set forth in claim 1 wherein said liquid crystals are formed upon evaporation of water from said formulation upon application to said foliage.

Sub A1 15. A formulation as set forth in claim 1 or 2 wherein the formulation comprises potassium glyphosate.

16. A formulation as set forth in claim 1, 2, or 9 wherein the glyphosate concentration is from about 400 g a.e./L to about 600 g a.e./L.

17. A formulation of claim 1, 2, 15 or 16 wherein the formulation has a cloud point of at least about 50°C and a crystallization point not higher than about 0°C.

18. A formulation of claim 16 wherein the formulation has a cloud point of at least about 60°C and a crystallization point not higher than about -10°C.

Sub A2 19. A formulation of claim 1, 2, 15, 16, 17, or 18 wherein the formulation has a viscosity of less than about 1000 c.p. at 0°C at 45/s shear rate.

20. A formulation of claim 1 wherein the formulation is a concentrate.

Sub A3 21. A formulation of claim 1 or 2 wherein the formulation has a density of at least about 1.210 grams/liter.

22. A formulation of claim 21 wherein the formulation has a density of at least about 1.215 grams/liter.

23. A formulation of claim 22 wherein the formulation has a density of at least about 1.220 grams/liter.

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*Sub A* 24. A formulation of claim 1 or 2 wherein the surfactant comprised by the formulation is not substantially antagonistic to the herbicidal activity of the glyphosate.

25. A formulation of claim 1, 2 or 15 further comprising a second herbicide.

26. A formulation of claim 1, 2 or 15 further including a dicarboxylic acid.

27. A formulation of claim 26 wherein the dicarboxylic acid is selected from the group consisting of oxalic acid, malonic acid, succinic acid, glutaric acid, maleic acid, adipic acid, and fumaric acid, and combinations or mixtures thereof.

*Sub B* 28. A formulation of claim 1 or 2 wherein the formulation comprises a salt of glyphosate selected from the group consisting of potassium glyphosate, monoammonium glyphosate, diammonium glyphosate, sodium glyphosate, monoethanolamine glyphosate, n-propylamine glyphosate, ethylamine glyphosate, ethylenediamine glyphosate, hexamethylenediamine glyphosate, trimethylsulfonium glyphosate and mixtures thereof.

29. A storage-stable herbicidal concentrate which may be diluted with water to provide an aqueous herbicidal application mixture for application to the foliage of a plant, said concentrate comprising glyphosate or a salt or ester thereof in a concentration of at least about 500 g a.e./l glyphosate acid equivalent, and a surfactant component, the nature and concentration of said surfactant component in said concentrate being such that, upon applying said application mixture to the foliage of a plant, anisotropic aggregates comprising said surfactant are formed on said plant foliage.

30. A storage-stable herbicidal concentrate as set forth in claim 29 which is substantially devoid of liquid crystals comprising said surfactant but having a composition such that, upon application to a plant of said concentrate or said application mixture, liquid crystals comprising said surfactant are formed in or on said plant foliage.

31. A storage-stable herbicidal concentrate as set forth in claim 29 wherein the nature and concentration of said surfactant component in said concentrate being such that, upon applying said application mixture to the foliage of a plant, liquid crystals comprising said surfactant are formed on the plant foliage.

32. A storage-stable herbicidal concentrate of claim 29, 30, or 31 wherein the concentrate comprises a salt of glyphosate selected from the group consisting of potassium glyphosate, monoammonium glyphosate, diammonium glyphosate, sodium glyphosate, monoethanolamine glyphosate, n-propylamine glyphosate, ethylamine glyphosate, ethylenediamine glyphosate, hexamethylenediamine glyphosate, trimethylsulfonium glyphosate and mixtures thereof.

33. A storage-stable herbicidal concentrate as set forth in claim 31 containing said surfactant in a weight ratio to glyphosate acid equivalent of at least about 0.05.

34. A storage-stable herbicidal concentrate as set forth in claim 31 containing said surfactant in a weight ratio to glyphosate acid equivalent between about 0.05 and about 0.33.

35. A storage-stable herbicidal concentrate as set forth in claim 29 wherein anisotropic aggregates are formed in said plant foliage upon application to said foliage of said application mixture and evaporation of water from the application mixture on said foliage.

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36. A storage-stable herbicidal concentrate as set forth in claim 29, 31 or 35 wherein the concentrate comprises potassium glyphosate.

37. A storage-stable herbicidal concentrate as set forth in claim 29, 30, 31 or 35 wherein the glyphosate concentration is from about 500 g a.e./L to about 600 g a.e./L.

38. A storage-stable herbicidal concentrate of claim 29, 30, 31, 35 or 37 wherein the concentrate has a cloud point of at least about 50°C and a crystallization point of not higher than about 0°C.

39. A storage-stable herbicidal concentrate of claim 29, 30, 31, or 35 wherein the concentrate has a density of at least about 1.210 grams/liter.

40. A storage-stable herbicidal concentrate of claim 29, 30, 31, or 35 wherein the surfactant comprised by the concentrate is not substantially antagonistic to the herbicidal activity of the glyphosate.

41. A storage-stable herbicidal concentrate of claim 38 wherein the concentrate has a cloud point of at least about 60°C and a crystallization point of not higher than about -10°C.

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42. A storage-stable herbicidal concentrate of claim 29, 30, 31, 35, 37, or 38 wherein the concentrate has a viscosity of less than about 1000 c.p. at 0°C at 45/s shear rate.

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45. A formulation as set forth in claim 44 wherein the glyphosate concentration is from about 500 g a.e./L to about 600 g a.e./L.

47. A formulation of claim 44 wherein the formulation has a density of at least about 1.210 grams/liter.

48. A formulation of claim 44 wherein the surfactant comprised by the formulation is not substantially antagonistic to the herbicidal activity of the glyphosate.

49. A formulation of claim 46 wherein the formulation has a cloud point of at least about 60°C and a crystallization point of not higher than about -10°C.

50. A formulation of claim 44 wherein the formulation has a viscosity of less than about 1000 c.p. at 0°C at 45/s shear rate.

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54. A storage-stable herbicidal concentrate of claim 52 or 53 wherein the concentrate has a cloud point of at least about 50°C and a crystallization point of not higher than about 0°C.

55. A storage-stable herbicidal concentrate of claim 54 wherein the concentrate has a cloud point of at least about 60°C and a crystallization point of not higher than about -10°C.

56. A storage stable herbicidal concentrate which may be diluted with water to provide an aqueous herbicidal application mixture for application to the foliage of a plant, said concentrate comprising a potassium, monoammonium, diammonium, sodium, monoethanolamine, n-propylamine, ethylamine,



5 ethylenediamine, hexamethylenediamine, or trimethylsulfonium salt of  
glyphosate and having a glyphosate acid equivalent concentration of at least  
270 grams per liter, the nature of said surfactant and the composition of said  
concentrate being such that, upon application to a plant of the concentrate or  
said application mixture, anisotropic aggregates comprising said surfactant are  
10 formed on said plant foliage.

57. A storage stable herbicidal concentrate as set forth in claim 56  
wherein the nature and concentration of said surfactant component in said  
concentrate are such that, upon applying said application mixture to the foliage  
of a plant, liquid crystals comprising said surfactant are formed within the  
cuticles of the plant foliage.

58. A formulation of claim 44 wherein the formulation comprises a salt of  
glyphosate selected from the group consisting of potassium glyphosate,  
monoammonium glyphosate, diammonium glyphosate, sodium glyphosate,  
monoethanolamine glyphosate, n-propylamine glyphosate, ethylamine  
glyphosate, ethylenediamine glyphosate, hexamethylenediamine glyphosate,  
trimethylsulfonium glyphosate and mixtures thereof.

Sub All 59. A storage stable herbicidal concentrate of claim 52 or 53 wherein the  
concentrate comprises a salt of glyphosate selected from the group consisting  
of potassium glyphosate, monoammonium glyphosate, diammonium  
glyphosate, sodium glyphosate, monoethanolamine glyphosate, n-propylamine  
glyphosate, ethylamine glyphosate, ethylenediamine glyphosate,  
5 hexamethylenediamine glyphosate, trimethylsulfonium glyphosate and mixtures  
thereof.

60. A concentrate as set forth in claim 56 or 57 wherein the glyphosate  
concentration is from about 400 g a.e./L to about 600 g a.e./L.

*Sub A 12*  
61. A concentrate of claim 56, 57 or 58 wherein the concentrate has a cloud point of at least about 50°C and a crystallization point of not higher than about 0°C.

62. A concentrate of claim 61 wherein the concentrate has a cloud point of at least about 60°C and a crystallization point of not higher than about -10°C.

*Sub A 12*  
63. A concentrate of claims 52, 53, 56, or 57 wherein the concentrate has a viscosity of less than about 1000 c.p. at 0°C at 45/s shear rate.

64. A concentrate of claims 63 wherein the concentrate has a viscosity of less than about 250 c.p. at 0°C at 45/s shear rate.

*65*  
64. A concentrate of claim 52, 53, 56, or 57 wherein the concentrate has a density of at least about 1.210 grams/liter.

66. A concentrate of claim 52, 53, 56, or 57 wherein the surfactant comprised by the concentrate is not substantially antagonistic to the herbicidal activity of the glyphosate.

67. A formulation useful in retarding the growth of vegetation comprising an aqueous mixture containing a surfactant, glyphosate or a salt or ester thereof, and a dicarboxylic acid, the nature of said surfactant and the composition of said formulation being such that, upon application of the formulation to a plant, anisotropic aggregates comprising said surfactant are formed on the foliage of said plant.

68. A formulation as set forth in claim 67 wherein the nature of said surfactant and the composition of said formulation are such that, upon application of the formulation to a plant, liquid crystals comprising said surfactant are formed in the foliage of said plant

*Sub A* 69. A formulation as set forth in claim 67 or 68 wherein the glyphosate concentration is from about 400 g a.e./L to about 600 g a.e./L.

70. A formulation of claim 67 or 68 wherein the formulation has a cloud point of at least about 50°C and a crystallization point of not higher than about 0°C.

71. A formulation of claim 70 wherein the formulation has a cloud point of at least about 60°C and a crystallization point of not higher than about -10°C.

*Sub A* 72. A formulation of claim 67 or 68 wherein the formulation comprises a salt of glyphosate selected from the group consisting of potassium glyphosate, monoammonium glyphosate, diammonium glyphosate, sodium glyphosate, monoethanolamine glyphosate, n-propylamine glyphosate, ethylamine glyphosate, ethylenediamine glyphosate, hexamethylenediamine glyphosate, trimethylsulfonium glyphosate and mixtures thereof.

73. A formulation of claim 67 wherein the formulation has a density of at least about 1.210 grams/liter.

74. A formulation of claim 67 wherein the formulation has a viscosity of less than about 1000 c.p. at 0°C at 45/s shear rate.

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75. A formulation of claim 74 wherein the formulation has a viscosity of less than about 250 c.p. at 0°C at 45/s shear rate.

76. A formulation of claim 67 wherein the surfactant comprised by the formulation is not substantially antagonistic to the herbicidal activity of the glyphosate.

77. A formulation useful in retarding the growth of vegetation comprising an aqueous mixture containing a surfactant and glyphosate or a salt or ester thereof, said aqueous mixture having a specific gravity of at least about 1.210 grams/liter, the nature of said surfactant and the composition of said formulation being such that, upon application of the formulation to a plant, anisotropic aggregates comprising said surfactant are formed on the foliage of said plant.

78. A formulation of claim 77 wherein the anisotropic aggregates are formed in the foliage of said plant.

79. A formulation of claim 77 wherein the nature of said surfactant and the composition of said formulation are such that, upon application of the formulation to a plant, liquid crystals comprising said surfactant are formed in the foliage of the plant.

Sub #5 80. A formulation of claim 77, 78 or 79 wherein said formulation comprises more than about 400 g a.e./L of glyphosate.

81. A formulation of claim 80 wherein said formulation comprises more than about 450 g a.e./L of glyphosate.

82. A formulation of claim 81 wherein said formulation comprises more than about 500 g a.e./L of glyphosate.

83. A formulation of claim 82 wherein said formulation comprises more than about 550 g a.e./L of glyphosate.

84. A formulation of claim 83 wherein said formulation comprises more than about 600 g a.e./L of glyphosate.

*Sub A 10* 85. A formulation of claim 77, 78 or 79 wherein said formulation comprises a glyphosate salt selected from the group consisting of potassium glyphosate, monoammonium glyphosate, diammonium glyphosate, sodium glyphosate, monoethanolamine, n-propylamine glyphosate, ethylamine glyphosate, ethylenediamine glyphosate, hexamethylenediamine glyphosate, trimethylsulfonium glyphosate, or isopropylamine glyphosate.

86. A formulation of claim 77, 78 or 79 wherein the surfactant comprising the formulation is not substantially antagonistic to the herbicidal activity of the glyphosate.

87. A formulation of claim 77, 78 or 79 wherein the formulation has a viscosity less than about 1000 c.p. at 0°C at 45/s shear rate.

88. A formulation of claim 87 wherein the formulation has a viscosity less than about 250 c.p. at 0°C at 45/s shear rate.

*Sub A 10* 89. A formulation of claim 77, 78 or 79 wherein the formulation has a cloud point of at least about 50°C and a crystallization point not higher than about 0°C.

90. A formulation of claim 89 wherein the formulation has a cloud point of at least about 60°C and a crystallization point not higher than about -10°C.

91. An aqueous herbicidal concentrate composition comprising

(a) glyphosate, predominantly in the form of the potassium salt thereof, in solution in an amount of in excess of 300 grams acid equivalent per liter of the composition; and

5 (b) a surfactant component in solution or stable suspension, emulsion or dispersion, comprising one or more surfactants in a total amount of about 20 to about 300 grams per liter of the composition;

wherein the composition has a viscosity of less than about 250 centipoise at 0°C at 45/s shear rate.

92. An aqueous herbicidal concentrate composition comprising

(a) glyphosate, predominantly in the form of the potassium salt thereof, in solution in an amount of in excess of 300 grams acid equivalent per liter of the composition; and

(b) a surfactant component in solution or stable suspension, emulsion or dispersion, comprising one or more surfactants in a total amount of about 20 to about 300 grams per liter of the composition;

wherein the composition when free of dye or a coloring agent has a Gardner color value of not more than 14.

93. An aqueous herbicidal concentrate composition comprising

(a) glyphosate, predominantly in the form of the potassium salt thereof, in solution in an amount of in excess of 300 grams acid equivalent per liter of the composition; and

5 (b) a surfactant component in solution or stable suspension, emulsion or dispersion, comprising one or more surfactants in a total amount of about 20 to about 300 grams per liter of the composition;

wherein the composition has a viscosity less than a similarly loaded glyphosate potassium salt composition comprising an alkylpolyglycoside surfactant in combination with an alkoxylated alkylamine surfactant, said

alkylpolyglycoside and alkylamine surfactants being present in a weight ratio between about 5:1 and 1:1.

94. An aqueous herbicidal concentrate composition comprising

(a) glyphosate, predominantly in the form of the potassium salt thereof, in solution in said water in an amount of in excess of 300 grams acid equivalent per liter of the composition; and

(b) a surfactant component in solution or stable suspension, emulsion, or dispersion in said water, comprising one or more surfactants in a total amount of about 20 to about 300 grams per liter of the composition;

wherein said surfactant component contains no effective amount of an alkylpolyglycoside and is selected such that the composition remains substantially homogeneous when stored at 50°C for about 14 to 28 days.

95. An aqueous herbicidal concentrate composition comprising

(a) glyphosate, predominantly in the form of the potassium salt thereof, in solution in said water in an amount of in excess of 300 grams acid equivalent per liter of the composition; and

(b) a surfactant component in solution or stable suspension, emulsion, or dispersion in said water, comprising one or more surfactants in a total amount of about 20 to about 300 grams per liter of the composition;

wherein said surfactant component contains an effective amount of alkylpolyglycoside in combination with at least one additional surfactant that contains no effective amount of an alkoxylated alkylamine.

96. An aqueous herbicidal concentrate composition comprising

(a) glyphosate, predominantly in the form of the potassium salt thereof, in solution in said water in an amount of in excess of 300 grams acid equivalent per liter of the composition; and

(b) a surfactant component in solution or stable suspension, emulsion, or

dispersion in said water, comprising one or more surfactants in a total amount of about 20 to about 300 grams per liter of the composition;

wherein the composition controls velvetleaf growth to a greater extent than a similarly loaded glyphosate potassium salt composition comprising an alkylpolyglycoside surfactant in combination with an alkoxylated alkylamine surfactant in a weight ratio of alkylpolyglycoside to alkylamine surfactant of between about 5:1 and 1:1.

97. An aqueous herbicidal concentrate composition comprising

(a) glyphosate, predominantly in the form of the potassium salt thereof, in solution in said water in an amount in excess of 300 grams acid equivalent per liter of the composition; and

(b) a surfactant component in solution or stable suspension, emulsion, or dispersion in said water, comprising one or more surfactants in a total amount of about 20 to about 300 grams per liter of the composition;

wherein the composition has a viscosity of less than about 250 centipoise at 0°C at 45/s shear rate, and said surfactant component comprises one or more amine or quaternary ammonium salt compounds, each of which comprises an alkyl or aryl substituent having from about 4 to about 16 carbon atoms and not more than ten ethylene oxide linkages within the compound, said compounds being present in an amount which enhances the compatibility of said surfactant component with said glyphosate salt.

98. An aqueous herbicidal concentrate composition comprising

(a) glyphosate, or a salt or ester thereof, in solution in said water in an amount in excess of 300 grams acid equivalent per liter of the composition; and

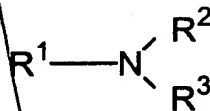
(b) a surfactant component in solution or stable suspension, emulsion, or dispersion in said water, comprising one or more surfactants in a total amount of about 20 to about 300 grams per liter of the composition;

wherein said surfactant component comprises one or more amine or



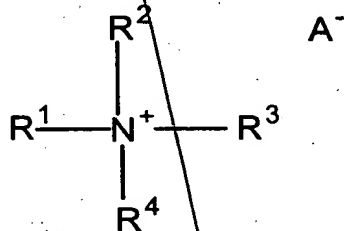
quaternary ammonium salt compounds, each of which comprises an alkyl or aryl substituent having from about 4 to about 16 carbon atoms and not more than ten ethylene oxide linkages within the compound, said compounds being present in an amount which enhances the compatibility of said surfactant component with the glyphosate.

99. A composition of claim 97 or 98 wherein said compounds are selected from the group consisting of amines or quaternary ammonium salts having the formula:



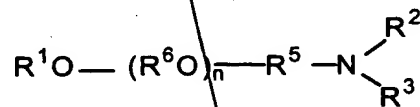
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or



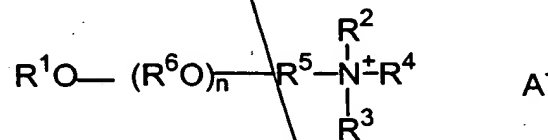
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or



(88)

or



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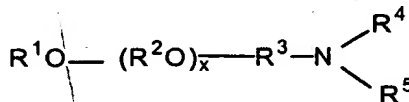
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wherein R<sup>1</sup> is linear or branched alkyl or aryl having from about 4 to about 16 carbon atoms, R<sup>2</sup> is hydrogen, methyl, ethyl, or -(CH<sub>2</sub>CH<sub>2</sub>O)<sub>x</sub>H, R<sup>3</sup> is hydrogen, methyl, ethyl, or -(CH<sub>2</sub>CH<sub>2</sub>O)<sub>y</sub>H wherein the sum of X and y is not more than about 5; R<sup>4</sup> is hydrogen or methyl; R<sup>6</sup> in each of the n (R<sup>6</sup>O) groups is independently C<sub>2</sub>-C<sub>4</sub> alkylene; R<sup>5</sup> is hydrocarbylene or substituted hydrocarbylene having from 2 to about 6 carbon atoms; and A- is an agriculturally acceptable anion.

100. A surfactant compound selected from the group consisting of:

(a) monoalkoxylated amines having the formula:

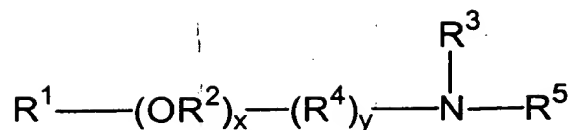


(23)

wherein R<sup>1</sup> is hydrogen or hydrocarbyl or substituted hydrocarbyl having at least 7 carbon atoms; R<sup>2</sup> in each of the x (R<sup>2</sup>O) and y (R<sup>2</sup>O) groups is independently C<sub>2</sub>-C<sub>4</sub> alkylene; R<sup>3</sup> is a hydrocarbylene or substituted hydrocarbylene having from 2 to about 6 carbon atoms; R<sup>4</sup> and R<sup>5</sup> are each independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, -(R<sup>6</sup>)<sub>n</sub>-(R<sup>2</sup>O)<sub>y</sub>R<sup>7</sup>, or R<sup>4</sup> and R<sup>5</sup>, together with the nitrogen atom to which they are attached, form a cyclic or heterocyclic ring; R<sup>6</sup> is hydrocarbylene or substituted hydrocarbylene containing from 1 to about 6 carbon atoms, R<sup>7</sup> is hydrogen or a linear or branched alkyl group having 1 to about 4 carbon atoms, n is 0 or 1, and x and y are independently an average number from 1 to about 60, provided, however, that when R<sup>2</sup> and R<sup>3</sup> in each of the x (R<sup>2</sup>O) groups is ethylene, R<sup>1</sup> is other than unsubstituted alkyl or R<sup>4</sup> is other than hydrogen or unsubstituted alkyl when R<sup>5</sup> is hydrogen or unsubstituted alkyl, and when R<sup>2</sup> and R<sup>3</sup> are isopropylene and x is 1, R<sup>1</sup> is other than unsubstituted alkyl or R<sup>4</sup> is other than -(R<sup>2</sup>O)<sub>y</sub>R<sup>7</sup>;

(b) alkoxyated poly(hydroxyalkyl)amines having the formula:

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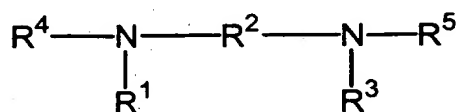


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(24)

wherein  $R^1$  and  $R^3$  are independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $R^2$  in each of the  $x$  ( $R^2O$ ) groups is independently  $C_2-C_4$  alkylene;  $R^4$  is hydrocarbylene or substituted hydrocarbylene having from 1 to about 30 carbon atoms,  $R^5$  is hydroxyalkyl, polyhydroxyalkyl, or poly(hydroxyalkyl)alkyl;  $x$  is an average number from 0 to about 30, and  $y$  is 0 or 1;

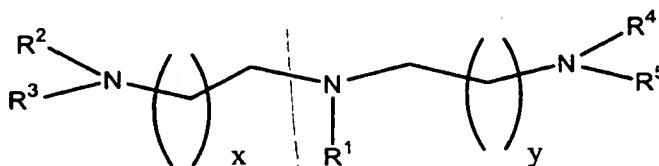
(c) di-poly(hydroxyalkyl)amines having the formula:



(27)

wherein  $R^1$  and  $R^3$  are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 22 carbon atoms,  $R^2$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 18 carbon atoms,  $R^4$  and  $R^5$  are independently hydroxyalkyl, polyhydroxyalkyl, or poly(hydroxyalkyl)alkyl, provided, however, that when  $R^1$  and  $R^3$  are methyl,  $R^2$  is other than octylene;

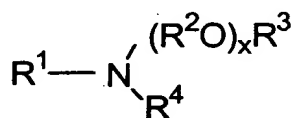
(d) alkoxyated triamines having the formula:



(29)

wherein  $R^1$  is hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms;  $R^2$ ,  $R^3$ ,  $R^4$  and  $R^5$  are independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, or  $-(R^8)_s$  ( $R^7-O$ ) $_nR^6$ ;  $R^6$  is hydrogen, or a linear or branched alkyl group having from 1 to about 4 carbon atoms;  $R^7$  in each of the  $n$  ( $R^7O$ ) groups is independently  $C_2-C_4$  alkylene;  $R^8$  is hydrocarbylene or substituted hydrocarbylene having from 1 to about 6 carbon atoms;  $n$  is an average number from 1 to about 10;  $s$  is 0 or 1; and  $x$  and  $y$  are independently an integer from 1 to about 4; provided, however, that when  $R^1$  is alkyl,  $R^2$  is other than hydrogen,  $x$  is 3 or 4, or  $R^4$  is other than  $-(R^7-O)_nR^6$ ;

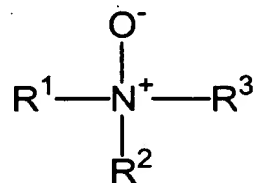
(e) monoalkoxylated amines having the formula:



(30)

wherein  $R^1$  is a hydrocarbyl or substituted hydrocarbyl group having from 1 to about 30 carbon atoms,  $R^2$  is  $C_2-C_4$  alkylene,  $R^3$  is hydrogen, or a linear or branched alkyl group having from 1 to about 4 carbon atoms,  $R^4$  is a linear or branched alkynyl, aryl, or aralkyl group having from 1 to about 30 carbon atoms, and  $x$  is an average number from 1 to about 60;

(f) amine oxides having the formula:

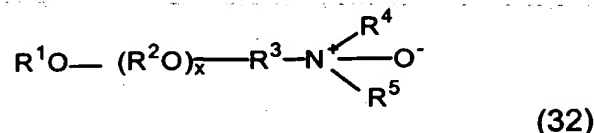


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wherein  $R^1$  is hydrocarbyl or substituted hydrocarbyl having from about 8 to about 30 carbon atoms,  $R^2$  and  $R^3$  are independently  $-(R^4O)_xR^5$ ,  $R^4$  in each of the  $x$  ( $R^4O$ ) groups is independently  $C_2-C_4$  alkylene,  $R^5$  is hydrogen, or a

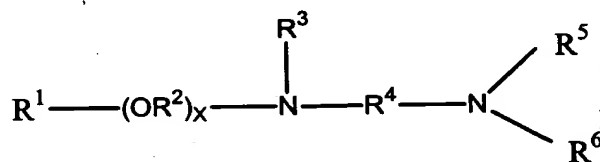
hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, x is an average number from 1 to about 50.

(g) an alkoxyated amine oxide having the formula:



wherein  $R^1$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms;  $R^2$  in each of the x ( $R^2O$ ) and y ( $R^2O$ ) groups is independently  $C_2-C_4$  alkylene;  $R^3$  is a hydrocarbylene or substituted hydrocarbylene having from 2 to about 6 carbon atoms;  $R^4$  and  $R^5$  are each independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $-(R^6)_n-(R^2O)_yR^7$ ;  $R^6$  is hydrocarbylene or substituted hydrocarbylene containing from 1 to about 6 carbon atoms,  $R^7$  is hydrogen or a linear or branched alkyl group having 1 to about 4 carbon atoms, n is 0 or 1, and x and y are independently an average number from 1 to about 60;

(h) alkoxyated diamines having the formula:

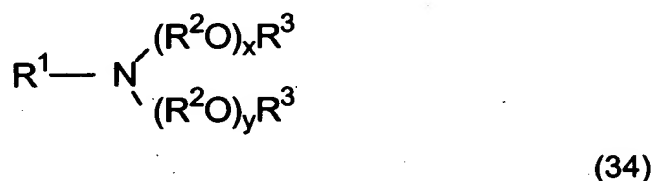


(33)

wherein  $R^1$  is hydrocarbyl or substituted hydrocarbyl having from about 8 to about 30 carbon atoms;  $R^2$  in each of the x ( $R^2O$ ) groups and the y ( $R^2O$ ) groups is independently  $C_2-C_4$  alkylene;  $R^3$ ,  $R^5$  and  $R^6$  are independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, or  $-(R^2O)_yR^7$ ;  $R^4$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 6 carbon atoms,  $-C(=NR^{11})NR^{12}R^{13}$ -,  $-C(=O)NR^{12}R^{13}$ -,  $-C(=S)NR^{12}R^{13}$ -,  $-C(=NR^{12})$ -,  $-C(S)$ -, or  $-C(O)$ -;  $R^7$  is hydrogen, or a linear or

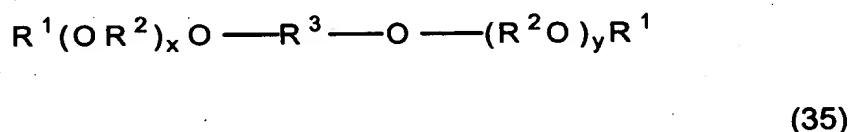
85 branched alkyl group having from 1 to about 4 carbon atoms;  $R^{11}$ ,  $R^{12}$  and  $R^{13}$   
 are hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30  
 carbon atoms  $x$  is an average number from 1 to about 30; and  $y$  is an average  
 number from 1 to about 50, provided, however, that at least one of  $R^3$ ,  $R^5$  and  $R^6$   
 is  $-(R^2O)_yR^7$ , at least one  $R^2$  is other than ethylene,  $R^4$  is other than  
 90 unsubstituted propylene,  $R^1$  is other than unsubstituted alkyl, or  $x$  is from 2 to  
 about 30;

(i) dialkoxylated amines having the formula:



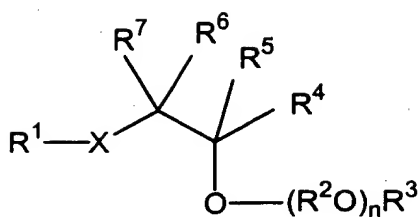
wherein  $R^1$  is a hydrocarbyl or substituted hydrocarbyl having from about 6 to  
 about 30 carbon atoms, or  $-R^4SR^5$ ,  $R^4$  and  $R^2$  in each of the  $x$   $(R^2O)$  and the  $y$   
 $(R^2O)$  groups is independently  $C_2-C_4$  alkylene,  $R^3$  is hydrogen, or a linear or  
 branched alkyl group having from 1 to about 4 carbon atoms,  $R^5$  is a linear or  
 branched alkyl group having from about 4 to about 15 carbon atoms, and  $x$  and  
 100  $y$  are independently an average number from 1 to about 40;

(j) dialkoxylated alcohols having the formula:



wherein  $R^1$  is independently hydrogen, or a linear or branched alkyl group  
 having from 1 to about 4 carbon atoms,  $R^2$  in each of the  $x$   $(R^2O)$  and the  $y$   
 $(R^2O)$  groups is independently  $C_2-C_4$  alkylene,  $R^3$  is hydrocarbylene or  
 substituted hydrocarbylene having from 2 to about 30 carbon atoms, and  $x$  and  
 105  $y$  are independently an average number from 1 to about 60; and

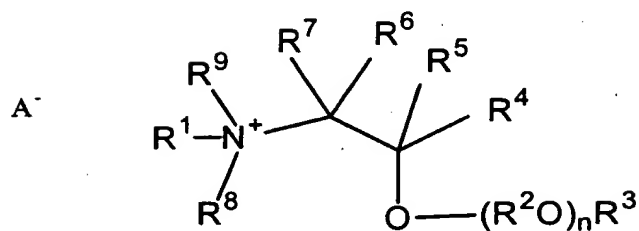
(k) compounds of the formula:



110

(36)

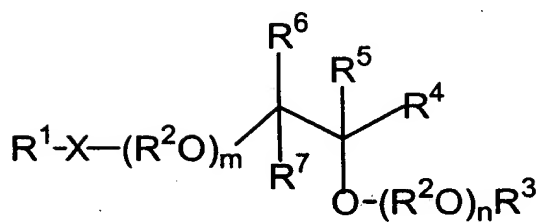
or

 $\text{A}^-$ 

115

(37)

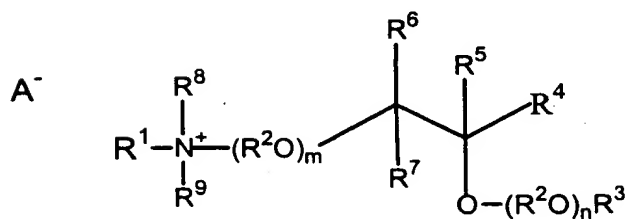
or



(38)

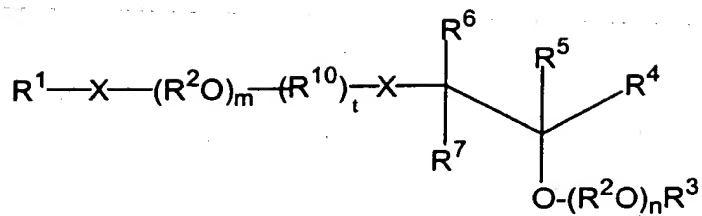
120

or

 $\text{A}^-$ 

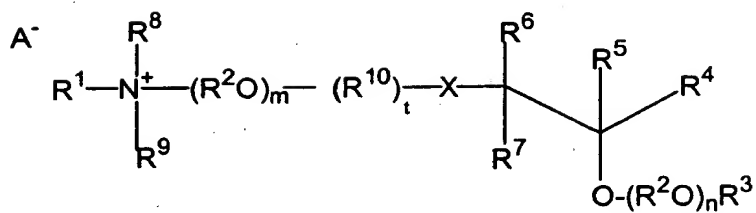
(39)

or



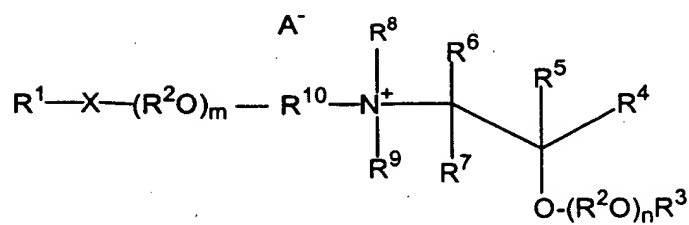
(40)

or



(41)

or

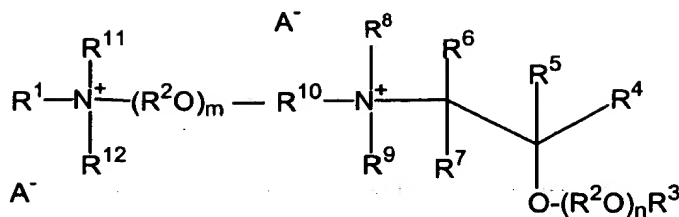


(42)

or



140



(43)

wherein  $\text{R}^1$ ,  $\text{R}^9$ , and  $\text{R}^{12}$  are independently hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, or  $-(\text{R}^2\text{O})_p\text{R}^{13}$ ;  $\text{R}^2$  in each of the  $m$   $(\text{R}^2\text{O})$ ,  $n$   $(\text{R}^2\text{O})$ ,  $p$   $(\text{R}^2\text{O})$  and  $q$   $(\text{R}^2\text{O})$  groups is independently  $\text{C}_2$ - $\text{C}_4$  alkylene;  $\text{R}^3$ ,  $\text{R}^8$ ,  $\text{R}^{11}$ ,  $\text{R}^{13}$  and  $\text{R}^{15}$  are independently hydrogen, or a hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms;  $\text{R}^4$  is  $-(\text{CH}_2)_y\text{OR}^{13}$  or  $-(\text{CH}_2)_y\text{O}(\text{R}^2\text{O})_q\text{R}^3$ ;  $\text{R}^5$ ,  $\text{R}^6$  and  $\text{R}^7$  are independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, or  $\text{R}^4$ ;  $\text{R}^{10}$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 30 carbon atoms;  $\text{R}^{14}$  is hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, or  $-(\text{CH}_2)_z\text{O}(\text{R}^2\text{O})_p\text{R}^3$ ;  $m$ ,  $n$ ,  $p$  and  $q$  are independently an average number from 1 to about 50;  $\text{X}$  is  $-\text{O}-$ ,  $-\text{N}(\text{R}^{14})-$ ,  $-\text{C}(\text{O})-$ ,  $-\text{C}(\text{O})\text{O}-$ ,  $-\text{OC}(\text{O})-$ ,  $-\text{N}(\text{R}^{15})\text{C}(\text{O})-$ ,  $-\text{C}(\text{O})\text{N}(\text{R}^{15})-$ ,  $-\text{S}-$ ,  $-\text{SO}-$ , or  $-\text{SO}_2-$ ;  $t$  is 0 or 1;  $\text{A}^-$  is an agriculturally acceptable anion; and  $y$  and  $z$  are independently an integer from 0 to about 30.

101. A composition for use in an aqueous pesticidal formulation containing a mixture of said surfactant compounds of claim 100.

102. A pesticidal composition comprising

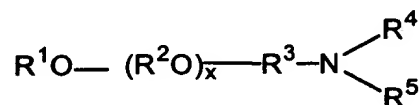
- (a) at least one pesticide; and
- (b) an agriculturally useful amount of at least one surfactant compound of claim 100.

103. A pesticidal composition comprising:

(i) at least one pesticide; and

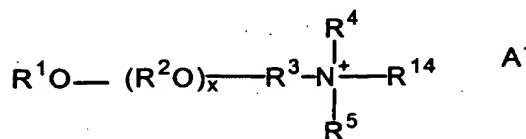
(ii) an agriculturally useful amount of at least one surfactant selected from the group consisting of:

(a) aminated alkoxyated alcohol having the formula:



(44)

or



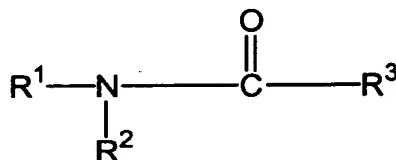
(45)

wherein  $R^1$  is hydrocarbyl or substituted hydrocarbyl containing at least 7 carbon atoms;  $R^2$  in each of the  $x$  ( $R^2O$ ) and  $y$  ( $R^2O$ ) groups is independently  $C_2-C_4$  alkylene;  $R^3$  and  $R^6$  are each independently hydrocarbylene or substituted hydrocarbylene having from 1 to about 6 carbon atoms;  $R^4$  is hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, hydroxy substituted hydrocarbyl,  $-(R^6)_n-(R^2O)_yR^7$ ,  $-C(=NR^{11})NR^{12}R^{13}$ ,  $-C(=O)NR^{12}R^{13}$ ,  $-C(=S)NR^{12}R^{13}$  or together with  $R^5$  and the nitrogen atom to which they are attached, form a cyclic or heterocyclic ring;  $R^5$  is hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, hydroxy substituted hydrocarbyl,  $-(R^6)_n-(R^2O)_yR^7$ ,  $-C(=NR^{11})NR^{12}R^{13}$ ,  $-C(=O)NR^{12}R^{13}$ ,  $-C(=S)NR^{12}R^{13}$ , or together with  $R^4$  and the nitrogen atom to which they are attached, form a cyclic or heterocyclic ring;  $R^7$  is hydrogen or a linear or branched alkyl group having 1 to about 4 carbon atoms;  $R^{11}$ ,  $R^{12}$  and  $R^{13}$  are hydrogen, hydrocarbyl or substituted hydrocarbyl,  $R^{14}$  is hydrogen,

30 hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, hydroxy substituted hydrocarbyl,  $-(R^6)_n-(R^2O)_yR^7$ ,  $-C(=NR^{11})NR^{12}R^{13}$ ,  $-C(=O)NR^{12}R^{13}$ , or  $-C(=S)NR^{12}R^{13}$ , n is 0 or 1, x and y are independently an average number from 1 to about 60, and A- is an agriculturally acceptable anion, provided, however, that when  $R^2$  and  $R^3$  are isopropylene and x is 1,  $R^1$  is other than alkyl or  $R^4$  is other than  $-(R^2O)_yR^7$ ;

35

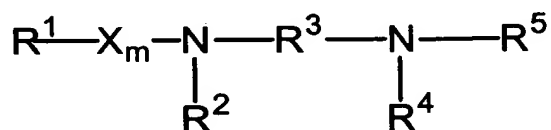
(b) hydroxylated amines having the formula:



(46)

wherein  $R^1$  is hydrocarbyl or substituted hydrocarbyl having from about 4 to about 30 carbon atoms,  $R^2$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, and  $R^3$  is hydroxyalkyl, polyhydroxyalkyl, or poly(hydroxyalkyl)alkyl;

(c) diamines having the formula:



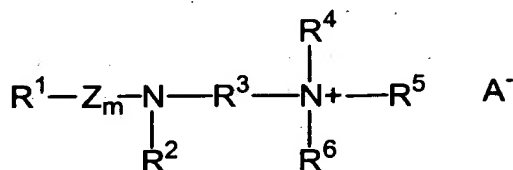
(48)

50 wherein  $R^1$ ,  $R^2$  and  $R^5$  are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms or  $-R^8(OR^9)_nOR^{10}$ ,  $R^3$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 18 carbon atoms,  $R^8$  and  $R^9$  are individually hydrocarbylene or substituted hydrocarbylene having from 2 to about 4 carbon atoms,  $R^4$  and  $R^{10}$  are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, m is 0 or 1, n is an average number from 0 to about 40, X is  $-C(O)-$  or -

55

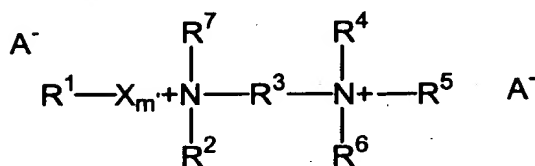
SO<sub>2</sub><sup>-</sup>, and A<sup>-</sup> is an agriculturally acceptable anion;

(d) mono- or di-ammonium salts having the formula:



(49)

or

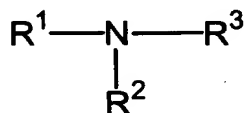


(50)

wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>4</sup>, R<sup>5</sup> and R<sup>7</sup> are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms or -

R<sup>8</sup>(OR<sup>9</sup>)<sub>n</sub>OR<sup>10</sup>, R<sup>6</sup> is hydrocarbyl or substituted hydrocarbyl having from about 1 to about 30 carbon atoms, R<sup>3</sup> is hydrocarbylene or substituted hydrocarbylene having from 2 to about 18 carbon atoms, R<sup>8</sup>, R<sup>9</sup> and R<sup>11</sup> are individually hydrocarbylene or substituted hydrocarbylene having from 2 to about 4 carbon atoms, R<sup>10</sup> is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, m is 0 or 1, n is an average number from 0 to about 40, X is -C(O)- or -SO<sub>2</sub>-, Z is -C(O)-, and A<sup>-</sup> is an agriculturally acceptable anion;

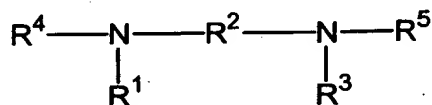
(e) poly(hydroxyalkyl)amines having the formula:



(51)

wherein R<sup>1</sup> is hydrocarbyl or substituted hydrocarbyl having from about 4 to about 30 carbon atoms or -R<sup>4</sup>OR<sup>5</sup>, R<sup>2</sup> is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, R<sup>3</sup> is hydroxyalkyl, polyhydroxyalkyl, or poly(hydroxyalkyl)alkyl, R<sup>4</sup> is hydrocarbylene or substituted hydrocarbylene having from 2 to about 18 carbon atoms, and R<sup>5</sup> is hydrogen or hydrocarbyl or substituted hydrocarbyl having from about 1 to about 30 carbon atoms.

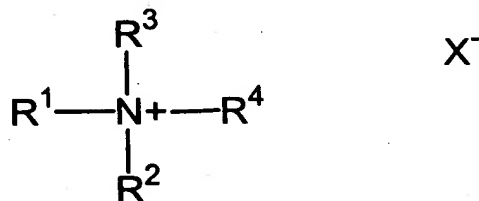
(f) di-poly(hydroxyalkyl)amine having the formula:



(54)

wherein R<sup>1</sup> and R<sup>3</sup> are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 22 carbon atoms, R<sup>2</sup> is hydrocarbylene or substituted hydrocarbylene having from 2 to about 18 carbon atoms, and R<sup>4</sup> and R<sup>5</sup> are independently hydroxyalkyl, polyhydroxyalkyl, or poly(hydroxyalkyl)alkyl;

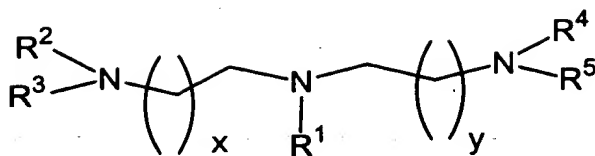
(g) quaternary poly(hydroxyalkyl)amine salts having the formula:



(56)

wherein R<sup>1</sup> is hydrocarbyl or substituted hydrocarbyl having from about 4 to about 30 carbon atoms, R<sup>2</sup> and R<sup>3</sup> are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, and R<sup>4</sup> is hydroxyalkyl, polyhydroxyalkyl, or poly(hydroxyalkyl)alkyl;

(h) triamines having the formula:



(59)

wherein R<sup>1</sup> is hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms; R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> are independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, or -(R<sup>8</sup>)<sub>s</sub> (R<sup>7</sup>O)<sub>n</sub>R<sup>6</sup>; R<sup>6</sup> is hydrogen or a linear or branched alkyl group having from 1 to about 4 carbon atoms, R<sup>7</sup> in each of the n (R<sup>7</sup>O) groups is independently C<sub>2</sub>-C<sub>4</sub> alkylene; R<sup>8</sup> is hydrocarbylene or substituted hydrocarbylene having from 1 to about 6 carbon atoms, n is an average number from 1 to about 10, s is 0 or 1, and x and y are independently an integer from 1 to about 4;

and mixtures thereof, wherein the pesticide is other than a bacteriocide if the composition includes a surfactant of group (a) or (d).

Sub A19. 104. A composition of claim 102 or 103 wherein the pesticide comprises a herbicide.

105. A composition of claim 104 wherein the herbicide comprises glyphosate or a salt or ester thereof.

106. A composition of claim 105 wherein the glyphosate is predominantly in the form of the potassium, monoammonium, diammonium, sodium, monoethanolamine, n-propylamine, ethylamine, ethylenediamine, hexamethylenediamine or trimethylsulfonium salt thereof.

107. An aqueous herbicidal composition comprising:  
(a) glyphosate or a salt or ester thereof; and

(b) an agriculturally useful amount of at least one surfactant compound of claim 100.

108. An aqueous herbicidal composition comprising

(a) glyphosate, predominantly in the form of the potassium, monoammonium, diammonium, sodium, monoethanolamine, n-propylamine, ethylamine, ethylenediamine, hexamethylenediamine or trimethylsulfonium salt thereof; and

(b) an agriculturally useful amount of at least one surfactant compound of claim 100.

109. A composition of claim 108 wherein the glyphosate is predominantly in the form of the potassium salt.

110. An aqueous herbicidal concentrate composition comprising:

(i) glyphosate predominantly in the form of the potassium, monoammonium, diammonium, sodium, monoethanolamine, n-propylamine, ethylamine, ethylenediamine, hexamethylenediamine or trimethylsulfonium salt thereof, in solution in said water in an amount of in excess of 300 grams acid equivalent per liter of the composition; and

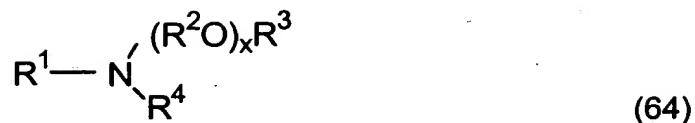
(ii) a surfactant component comprising one or more surfactant(s) in a total amount of about 20 to about 300 grams per liter of composition, said surfactant(s) being selected from the group consisting of:

(a) a secondary or tertiary amine having the formula:



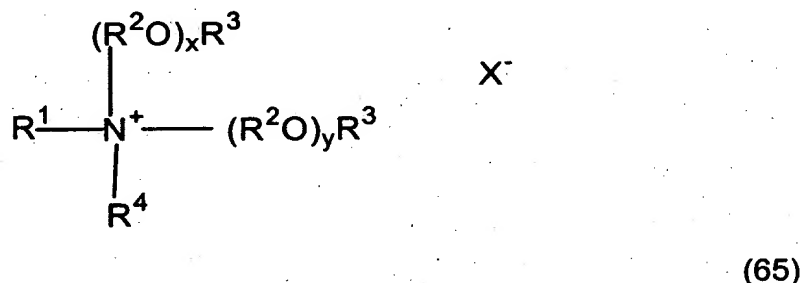
wherein  $\text{R}^1$  and  $\text{R}^2$  are hydrocarbyl having from 1 to about 30 carbon atoms, and  $\text{R}^3$  is hydrogen or hydrocarbyl having from 1 to about 30 carbon atoms;

(b) monoalkoxylated amines having the formula:



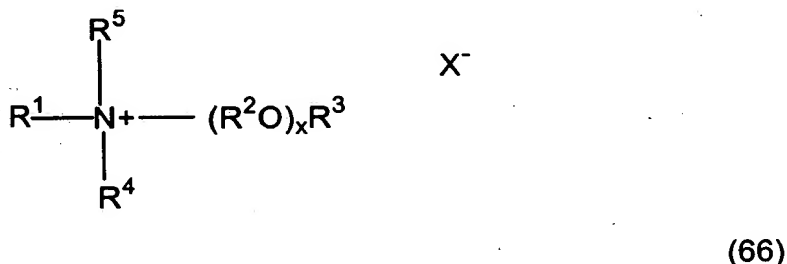
wherein  $\text{R}^1$  and  $\text{R}^4$  are independently hydrocarbyl or substituted hydrocarbyl groups having from 1 to about 30 carbon atoms or  $-\text{R}^5\text{SR}^6$ ,  $\text{R}^2$  in each of the  $x$   $(\text{R}^2\text{O})$  groups is independently  $\text{C}_2\text{-C}_4$  alkylene,  $\text{R}^3$  is hydrogen, or a linear or branched alkyl group having from 1 to about 4 carbon atoms,  $\text{R}^5$  is a linear or branched alkyl group having from about 6 to about 30 carbon atoms,  $\text{R}^6$  is a hydrocarbyl or substituted hydrocarbyl group having from 4 to about 15 carbon atoms and  $x$  is an average number from 1 to about 60;

(c) dialkoxylated quaternary ammonium salt having the formula:



wherein  $\text{R}^1$  is hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $\text{R}^2$  in each of the  $x$   $(\text{R}^2\text{O})$  and  $y$   $(\text{R}^2\text{O})$  groups is independently  $\text{C}_2\text{-C}_4$  alkylene,  $\text{R}^3$  is hydrogen, or a linear or branched alkyl group having from 1 to about 4 carbon atoms,  $\text{R}^4$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $x$  and  $y$  are independently an average number from 1 to about 40, and  $\text{X}^-$  is an agriculturally acceptable anion;

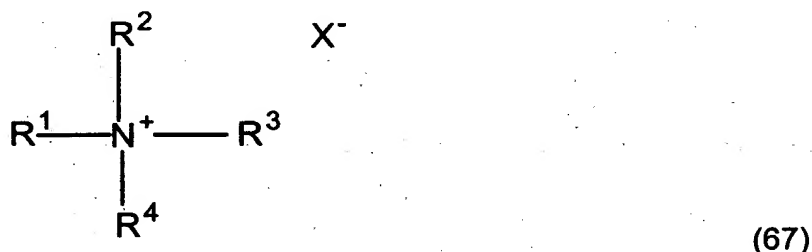
(d) monoalkoxylated quaternary ammonium salts having the formula:





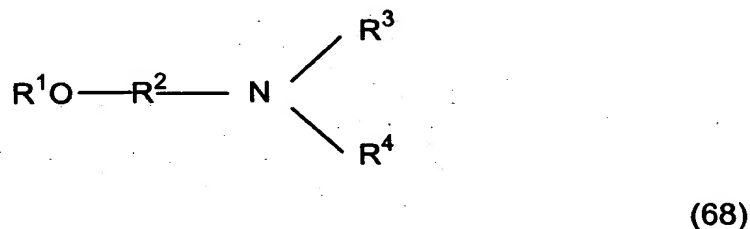
wherein  $R^1$  and  $R^5$  are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $R^4$  is hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $R^2$  in each of the  $x(R^2O)$  groups is independently  $C_2-C_4$  alkylene,  $R^3$  is hydrogen, or a linear or branched alkyl group having from 1 to about 30 carbon atoms,  $x$  is an average number from 1 to about 60, and  $X^-$  is an agriculturally acceptable anion;

(e) quaternary ammonium salts having the formula:



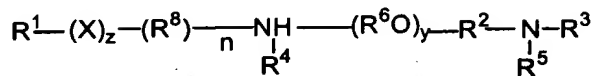
wherein  $R^1$ ,  $R^3$  and  $R^4$  are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $R^2$  is hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, and  $X^-$  is an agriculturally acceptable anion;

(f) ether amines having the formula:



wherein  $R^1$  is hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms;  $R^2$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 30 carbon atoms;  $R^3$  and  $R^4$  are independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, or  $-(R^5O)_xR^6$ ,  $R^5$  in each of the  $x(R^5O)$  groups is independently  $C_2-C_4$  alkylene,  $R^6$  is hydrogen, or a linear or branched alkyl group having from 1 to about 4 carbon atoms, and  $x$  is an average number from 1 to about 50;

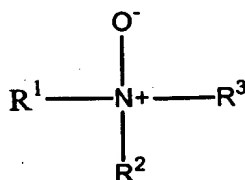
(g) diamines having the formula:



(69)

wherein  $R^1$ ,  $R^3$ ,  $R^4$  and  $R^5$  are independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, or  $-(R^6O)_xR^7$ ;  $R^2$  and  $R^8$  are independently hydrocarbylene or substituted hydrocarbylene having from 2 to about 30 carbon atoms,  $R^6$  in each of the  $x$   $(R^6O)$  and  $y$   $(R^6O)$  groups is independently  $C_2$ - $C_4$  alkylene,  $R^7$  is hydrogen, or a linear or branched alkyl group having from 1 to about 30 carbon atoms,  $x$  is an average number from 1 to about 30,  $X$  is  $-O-$ ,  $-N(R^9)-$ ,  $-C(O)-$ ,  $-C(O)O-$ ,  $-OC(O)-$ ,  $-N(R^9)C(O)-$ ,  $-C(O)N(R^9)-$ ,  $-S-$ ,  $-SO-$ , or  $-SO_2-$ ,  $y$  is 0 or an average number from 1 to about 30,  $n$  and  $z$  are independently 0 or 1, and  $R^9$  is hydrogen or hydrocarbyl or substituted hydrocarbyl;

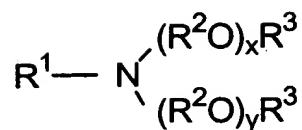
(h) amine oxides having the formula:



(70)

wherein  $R^1$ ,  $R^2$  and  $R^3$  are independently hydrogen, hydrocarbyl or substituted hydrocarbyl,  $-(R^4O)_xR^5$ , or  $-R^6(OR^4)_xOR^5$ ;  $R^4$  in each of the  $x$   $(R^4O)$  groups is independently  $C_2$ - $C_4$  alkylene,  $R^5$  is hydrogen, or a linear or branched alkyl group having from 1 to about 30 carbon atoms,  $R^6$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 6 carbon atoms,  $x$  is an average number from 1 to about 50, and the total number of carbon atoms in  $R^1$ ,  $R^2$  and  $R^3$  is at least 8;

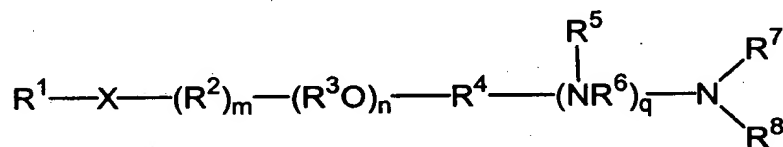
(i) dialkoxylated amines having the formula:



(71)

wherein  $R^1$  is a linear or branched alkyl, linear or branched alkenyl, linear or branched alkynyl, aryl, or aralkyl group having from about 6 to about 30 carbon atoms, or  $-R^4SH$ ,  $R^2$  in each of the  $x$  ( $R^2O$ ) and the  $y$  ( $R^2O$ ) groups is independently  $C_2-C_4$  alkylene,  $R^3$  is hydrogen, or a linear or branched alkyl group having from 1 to about 4 carbon atoms,  $R^4$  is a linear or branched alkyl group having from about 6 to about 30 carbon atoms, and  $x$  and  $y$  are independently an average number from 1 to about 40;

(j) aminated alkoxyated alcohols having the following chemical structure:

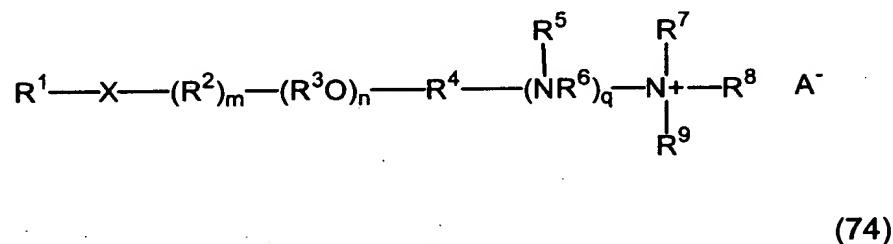


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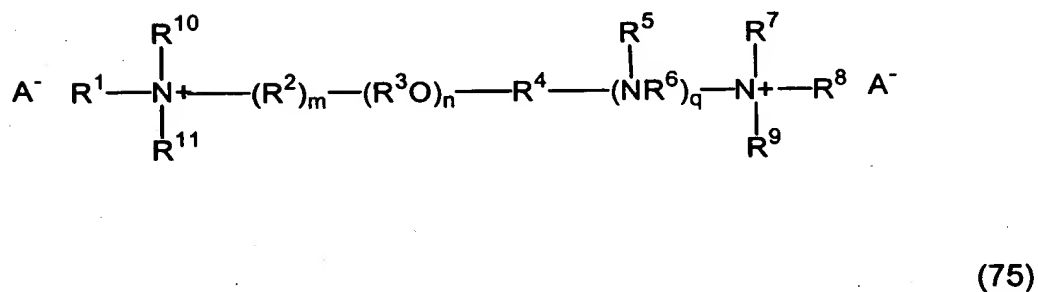
wherein  $R^1$ ,  $R^7$ ,  $R^8$ , and  $R^9$  are each independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, or  $-(R^{11})_s(R^3O)_vR^{10}$ ;  $X$  is  $-O-$ ,  $-OC(O)-$ ,  $-C(O)O-$ ,  $-N(R^{12})C(O)-$ ,  $-C(O)N(R^{12})-$ ,  $-S-$ ,  $-SO-$ ,  $-SO_2-$  or  $-N(R^9)-$ ;  $R^3$  in each of the  $n$  ( $R^3O$ ) groups and the  $v$  ( $R^3O$ ) groups is independently  $C_2-C_4$  alkylene;  $R^{10}$  is hydrogen, or a linear or branched alkyl group having from 1 to about 30 carbon atoms;  $n$  is an average number from 1 to about 60;  $v$  is an average number from 1 to about 50;  $R^2$  and  $R^{11}$  are each independently hydrocarbylene or substituted hydrocarbylene having from 1 to about 6 carbon atoms;  $R^4$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 6 carbon atoms;  $R^{12}$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms;  $m$  and  $s$  are

each independently 0 or 1;  $R^6$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 30 carbon atoms,  $-C(=NR^{12})-$ ,  $-C(S)-$ , or  $-C(O)-$ ;  $q$  is an integer from 0 to 5; and  $R^5$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms;

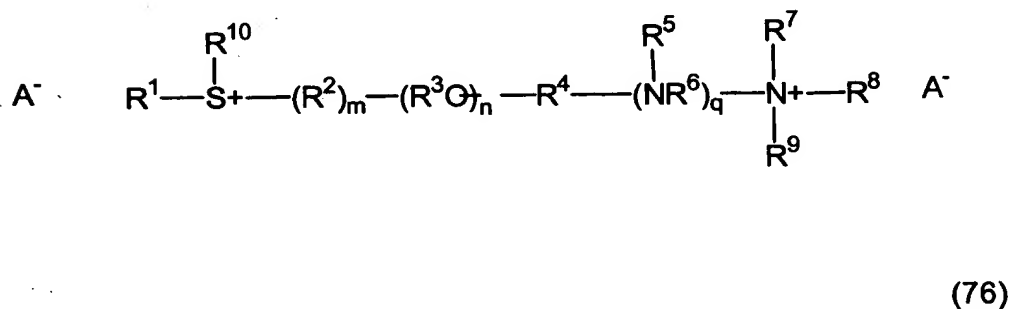
(k) quaternary ammonium, sulfonium and sulfoxonium salts having the formula:



or

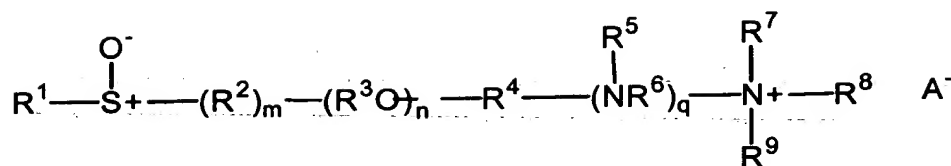


or



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or

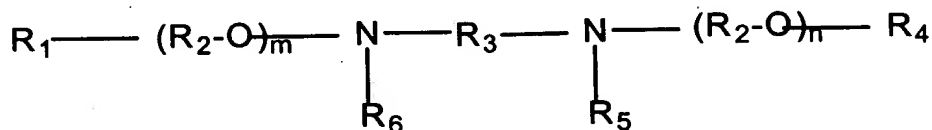


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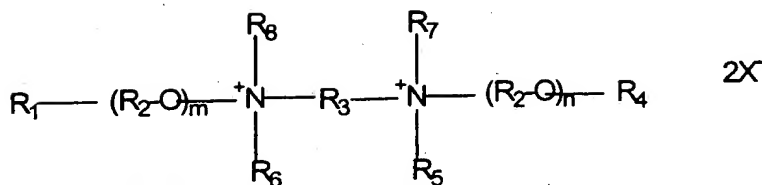
wherein  $R^1$ ,  $R^7$ ,  $R^8$ ,  $R^9$ ,  $R^{10}$  and  $R^{11}$  are independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, or  $-(R^{13})_s(R^3O)_vR^{12}$ ;  $X$  is  $-O-$ ,  $-OC(O)-$ ,  $-N(R^{14})C(O)-$ ,  $-C(O)N(R^{14})-$ ,  $-C(O)O-$ , or  $-S-$ ;  $R^3$  in each of the  $n$   $(R^3O)$  groups and  $v$   $(R^3O)$  groups is independently  $C_2-C_4$  alkylene;  $R^{12}$  is hydrogen, or a linear or branched alkyl group having from 1 to about 30 carbon atoms;  $n$  is an average number from 1 to about 60;  $v$  is an average number from 1 to about 50;  $R^2$  and  $R^{13}$  are each independently hydrocarbylene or substituted hydrocarbylene having from 1 to about 6 carbon atoms;  $m$  and  $s$  are each independently 0 or 1;  $R^4$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 6 carbon atoms;  $R^6$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 30 carbon atoms,  $-C(=NR^{12})-$ ,  $-C(S)-$ , or  $-C(O)-$ ;  $R^{14}$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $q$  is an integer from 0 to 5;  $R^5$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms; and each  $A^-$  is an agriculturally acceptable anion;

(I) a diamine or diammonium salt having the formula:



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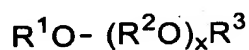
(78)



(79)

wherein  $R^1$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$  and  $R^8$  are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $R^2$  in each of the  $m$  ( $R^2O$ ) and  $n$  ( $R^2O$ ) groups and  $R^9$  are independently  $C_2$ - $C_4$  alkylene,  $R^3$  is hydrocarbylene or substituted hydrocarbylene having from about 2 to about 6 carbon atoms or  $-(R^2O)_pR^9$ ,  $m$  and  $n$  are individually an average number from 0 to about 50, and  $p$  is an average number from 0 to about 60;

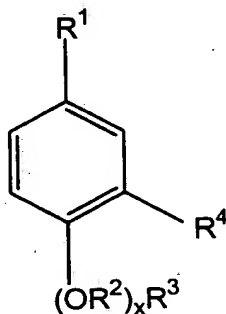
(m) alkoxyated alcohols having the formula:



(80)

wherein  $R^1$  is hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $R^2$  in each of the  $x$  ( $R^2O$ ) groups is independently  $C_2$ - $C_4$  alkylene,  $R^3$  is hydrogen, or a linear or branched alkyl group having from 1 to about 4 carbon atoms, and  $x$  is an average number from 1 to about 60;

(n) alkoxyated dialkylphenols having the formula:



(81)

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wherein  $R^1$  and  $R^4$  are independently hydrogen, or a linear or branched alkyl group having from 1 to about 30 carbon atoms and at least one of  $R^1$  and  $R^4$  is an alkyl group,  $R^2$  in each of the  $x$  ( $R^2O$ ) groups is independently  $C_2$ - $C_4$  alkylene,  $R^3$  is hydrogen, or a linear or branched alkyl group having from 1 to about 4 carbon atoms, and  $x$  is an average number from 1 to about 60; and mixtures thereof.

Sub A20

111. The composition of any one of claims 91, 92, 94-99, 106, or 108-110 wherein the composition has a viscosity less than a similarly loaded glyphosate potassium salt composition comprising an alkylpolyglycoside surfactant in combination with an alkoxyated alkylamine surfactant in a weight ratio of alkylglycoside to alkylamine surfactant of between about 5:1 and 1:1.

112. The composition of any one of claims 91-99, 110 or 111 wherein the surfactant component is in a stable emulsion.

113. The composition of any one of claims 91-99, 110 or 111 wherein the surfactant component is in a stable suspension.

114. The composition of any one of claims 91-99, 110 or 111 wherein the surfactant component is in a stable dispersion.

115. The composition of any one of claims 91-99 or 110-114 wherein the composition is stable after storage at 50°C for at least 14 days.

116. The composition of claim 115 wherein the composition is stable after storage at 50°C for about 28 days.

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*Sub A21* 117. The composition of any one of claims 91-99, 110 or 111 wherein the surfactant component is in a solution.

118. The composition of claim 117 wherein said surfactant component is selected such that the composition has a cloud point not lower than about 50°C.

*Sub A22* 119. The composition of any one of claims 92-96, 98, 99, or 102-118 wherein the composition has a viscosity of less than about 1000 centipoise at 0°C at 45/s shear rate.

120. The composition of Claim 119 wherein the composition has a viscosity of less than about 700 centipoise at 0°C at 45/s shear rate.

121. The composition of Claim 120 wherein the composition has a viscosity of less than about 400 centipoise at 0°C at 45/s shear rate.

122. The composition of Claim 121 wherein the composition has a viscosity of less than about 225 centipoise at 0°C at 45/s shear rate.

*Sub A23* 123. The composition of any one of claims 91-99 or 110-122 wherein said surfactant component is selected such that the composition exhibits no crystallization of said glyphosate or salt thereof when stored at a temperature of about 0°C for a period of about 7 days.

124. The composition of Claim 123 wherein said surfactant component is selected such that the composition exhibits no crystallization of said glyphosate or salt thereof when stored at a temperature of about -10°C for a period of about 7 days.



Sub A25

125. The composition of any one of claims 91-99 or 110-124 wherein said glyphosate, predominantly in the form of the potassium salt thereof, is in solution in the water in an amount of about 310 to about 600 grams of acid equivalent per liter of the composition

126. The composition of claim 125 wherein said glyphosate, predominantly in the form of the potassium salt thereof, is in solution in the water in an amount of about 360 to about 600 grams of acid equivalent per liter of the composition.

127. The composition of claim 126 wherein said glyphosate, predominantly in the form of the potassium salt thereof, is in solution in the water in an amount of about 400 to about 600 grams of acid equivalent per liter of the composition.

128. The composition of claim 127 wherein the concentration of said glyphosate is from about 450 to about 600 grams of acid equivalent per liter of the composition.

129. The composition of claim 128 wherein the concentration of said glyphosate is from about 500 to about 600 grams of acid equivalent per liter of the composition.

130. The composition of claim 129 wherein the concentration of said glyphosate is from about 480 to about 600 grams of acid equivalent per liter of the composition.

131. The composition of claim 130 wherein the concentration of said glyphosate is from about 480 to about 580 grams of acid equivalent per liter of the composition.

132. The composition of claim 130 wherein the concentration of said glyphosate is from about 540 to about 600 grams of acid equivalent per liter of the composition.

*Sub A23* 133. The composition of any one of claims 91-99 or 102-132 wherein the total amount of surfactant is from about 60 to about 240 grams per liter of the composition.

134. The composition of claim 133 wherein the total amount of surfactant is from about 60 to about 200 grams per liter of the composition.

135. The composition of Claim 134 wherein the total amount of surfactant is from about 20 to about 150 grams per liter of the composition.

136. The composition of claim 133 wherein the composition is substantially homogeneous upon storage at 50°C for one week.

*Sub A24* 137. The composition of any of claims 91-99 or 110-136 wherein said surfactant component predominantly comprises one or more surfactants each having a molecular structure comprising:

(1) a hydrophobic moiety having one or a plurality of independently saturated or unsaturated, branched or unbranched, aliphatic, alicyclic or aromatic C<sub>3-18</sub> hydrocarbyl or hydrocarbylidene groups joined together by 0 to about 7 linkages independently selected from ether, thioether, sulfoxide, ester, thioester and amide linkages, this hydrophobic moiety having in total a number *J* of carbon atoms where *J* is about 8 to about 30; and

(2) a hydrophilic moiety comprising:

(i) an amino group that is cationic or that can be protonated to become cationic, having attached directly thereto 0 to 3 oxyethylene groups or polyoxyethylene chains, these oxyethylene groups and polyoxyethylene chains

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Sub A 29

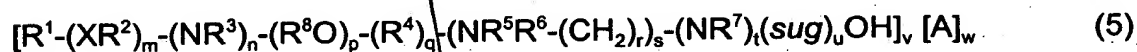
comprising on average no more than a number  $E$  of oxyethylene units per surfactant molecule such that  $E + J \leq 50$ ; and/or

(ii) an alkyl sugar derivative unit, such as a glycoside, polyglycoside, or aminoglycoside group comprising on average no more than about 2 of the alkyl sugar derivative units per surfactant molecule;

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said hydrophobic moiety being attached (a) directly to an amino group of said hydrophilic moiety, (b) to said hydrophilic moiety by an ether linkage incorporating an oxygen atom of one of said oxyethylene groups or of a terminal oxyethylene unit of one of said polyoxyethylene chains, or (c) to said hydrophilic moiety by an ether linkage to one of said alkyl sugar units.

138. The composition of any one of claims 91-99 or 110-137 wherein said surfactant component predominantly comprises one or more compounds having the formula



wherein  $R^1$  is hydrogen or  $C_{1-18}$  hydrocarbyl, each  $X$  is independently an ether, thioether, sulfoxide, ester, thioester or amide linkage, each  $R^2$  is independently  $C_{2-6}$  hydrocarbylidene,  $m$  is an average number of 0 to about 8, the total number of carbon atoms in  $R^1-(XR^2)_m$  is about 8 to about 24,  $n$  is 0 or 1,  $p$  is an average number of 0 to about 5,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$  and  $R^7$  are independently hydrogen or  $C_{1-4}$  hydrocarbyl,  $R^8$  is  $C_2-C_4$  alkylene,  $q$  is 0 or 1,  $r$  is 0 to 4,  $s$  is 0 or 1,  $t$  is 0 or 1,  $sug$  is an open or cyclic structure derived from sugars or a hydroxyalkyl, polyhydroxyalkyl or poly(hydroxyalkyl)alkyl group,  $u$  is an average number from 1 to about 2,  $A$  is an anionic entity, and  $v$  is an integer from 1 to 3 and  $w$  is 0 or 1 such that electrical neutrality is maintained.

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139. The composition of claim 138 wherein  $R^1$  is  $C_8H_{17}$  hydrocarbyl, m, p, q, s, t, and w are 0, n, u and v are 1,  $R^3$  is hydrogen, and *sug* is an open glucose derivative.

Sub A27

140. The composition of claim 137 or claim 138 wherein A is chloride, bromide, iodide, sulfate, ethosulfate, phosphate, acetate, propionate, succinate, lactate, citrate, tartrate or a glyphosate anion and t is 1.

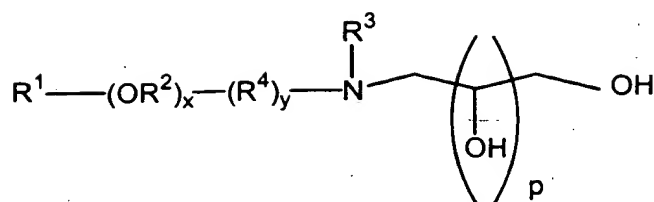
141. A composition of any one of claims 91-99 or 110-140 wherein the composition has a density of at least about 1.210 grams/liter.

142. A composition of any one of claims 91-99 or 110-141 wherein the surfactant comprised by the composition is not substantially antagonistic to the herbicidal activity of the glyphosate.

143. A herbicidal method comprising diluting in a suitable volume of water a herbicidally effective amount of a composition of any one of claims 91-99 or 110-142 to form an application composition, and applying the application composition to foliage of a plant or plants.

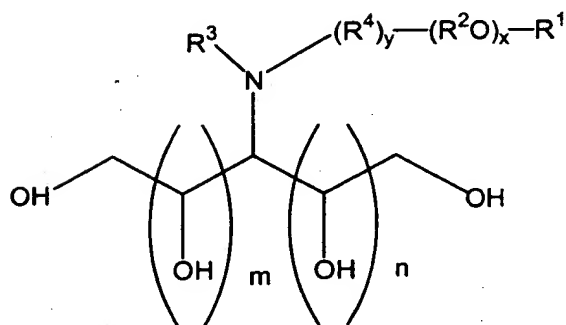
144. A herbicidal method comprising mixing a surfactant composition of claim 101 with a herbicide to form a herbicidal composition, diluting in a suitable volume of water a herbicidally effective amount of the herbicidal composition to form an application composition, and applying the application composition to foliage of a plant or plants.

145. A surfactant compound of claim 100 wherein said surfactant of formula (b) is an alkoxyated poly(hydroxyalkyl)amines having the formula:



(25)

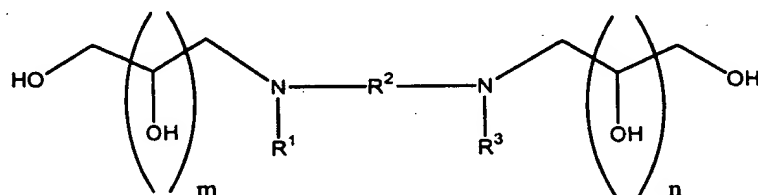
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(26)

wherein  $R^1$  and  $R^3$  are independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $R^2$  in each of the  $x$  ( $R^2O$ ) groups is independently  $C_2-C_4$  alkylene;  $R^4$  is hydrocarbylene or substituted hydrocarbylene having from 1 to about 30 carbon atoms,  $m$  and  $n$  are independently integers from 0 to about 7, the sum of  $m$  and  $n$  is not greater than about 7,  $p$  is an integer from 1 to about 8,  $x$  is an average number from 0 to about 30, and  $y$  is 0 or 1.

146. A surfactant compound of claim 100 wherein said surfactant of formula (c) is a di-poly(hydroxyalkyl)amine having the formula:



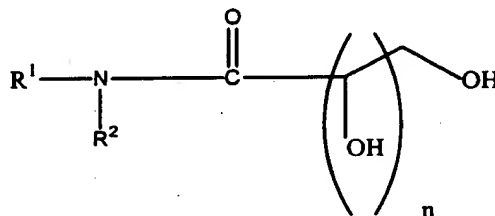
(28)

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wherein  $R^1$  and  $R^3$  are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 22 carbon atoms,  $R^2$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 18 carbon atoms, and  $m$  and  $n$  are independently integers from 1 to about 8, provided, however, that when  $R^1$  and  $R^3$  are methyl,  $R^2$  is other than octylene.

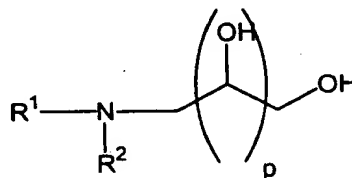
147. A surfactant compound of claim 103 wherein said surfactant of formula (b) is a hydroxylated amine having the formula:



(47)

wherein  $R^1$  is hydrocarbyl or substituted hydrocarbyl having from about 4 to about 30 carbon atoms,  $R^2$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, and  $n$  is 1 to about 8.

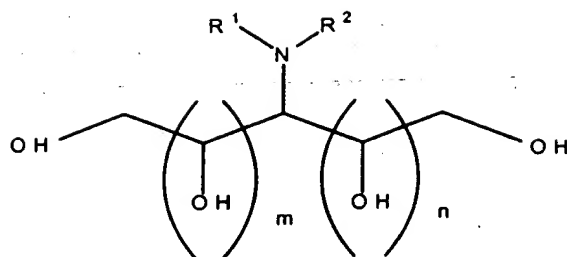
148. A surfactant compound of claim 103 wherein said surfactant of formula (e) is a poly(hydroxyalkyl)amine having the formula:



(52)

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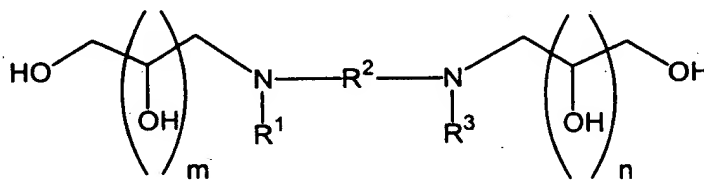
or



(53)

wherein  $R^1$  is hydrocarbyl or substituted hydrocarbyl having from about 4 to about 30 carbon atoms or  $-R^3OR^4$ ;  $R^2$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $R^3$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 18 carbon atoms,  $R^4$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from about 1 to about 30 carbon atoms,  $m$  and  $n$  are independently integers from 0 to about 7, the sum of  $m$  and  $n$  is not greater than about 7, and  $p$  is an integer from 1 to about 8.

149. A surfactant compound of claim 103 wherein said surfactant of formula (f) is a di-poly(hydroxyalkyl)amine having the formula:

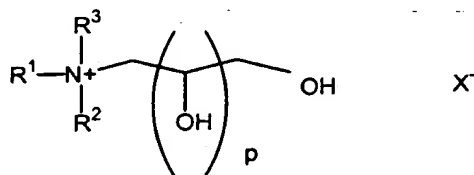


(55)

wherein  $R^1$  and  $R^3$  are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 22 carbon atoms,  $R^2$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 18 carbon atoms, and  $m$  and

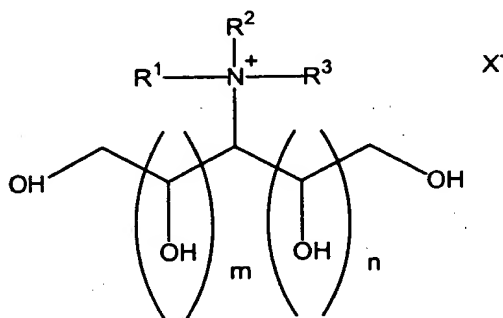
n are independently integers from 1 to about 8.

150. A surfactant compound of claim 103 wherein said surfactant of formula (g) is a quaternary poly(hydroxyalkyl)amine salt having the formula:



(57)

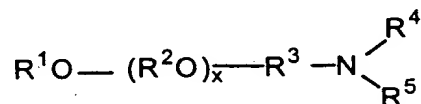
or



(58)

wherein R<sup>1</sup> is hydrocarbyl or substituted hydrocarbyl having from about 4 to about 30 carbon atoms, R<sup>2</sup> and R<sup>3</sup> are independently hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms, m and n are independently integers from 0 to about 7, the sum of m and n is not greater than about 7, and p is an integer from 1 to about 8.

151. A surfactant compound of claim 110 wherein said surfactant of formula (j) is a monoalkoxylated amine having the formula:



(73)



wherein  $R^1$  is hydrogen or hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms;  $R^2$  in each of the  $x$  ( $R^2O$ ) and  $y$  ( $R^2O$ ) groups is independently  $C_2$ - $C_4$  alkylene;  $R^3$  is hydrocarbylene or substituted hydrocarbylene having from 2 to about 30 carbon atoms;  $R^4$  and  $R^5$  are each independently hydrogen, hydrocarbyl or substituted hydrocarbyl having from 1 to about 30 carbon atoms,  $-(R^6)_n-(R^2O)_yR^7$ , or  $R^4$  and  $R^5$ , together with the nitrogen atom to which they are attached, form a cyclic or heterocyclic ring;  $R^6$  is hydrocarbylene or substituted hydrocarbylene having from 1 to about 30 carbon atoms;  $R^7$  is hydrogen or a linear or branched alkyl group having 1 to about 4 carbon atoms,  $n$  is 0 or 1,  $x$  and  $y$  are independently an average number from 1 to about 60.

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